

Patent claims

1. A method to assemble a substrate (3; 21) for a semiconductor package (1, 18) comprising the following steps:
  - 5       - providing a substrate (3; 21) comprising a sheet of core material (5) and a plurality of upper contact traces (6) and upper contact pads (7) on its upper surface, a second plurality of lower conducting traces (8) and external contact areas (9) on its bottom surface
  - 10       and conducting vias (10) connecting the upper conducting traces (6) and lower conducting traces (8),
  - forming a plurality of vent holes (4) in the substrate (3), and
  - covering the upper and lower surfaces of the substrate
  - 15       (3; 21) by a layer of solder resist (15) leaving the contact areas (6 and 8) free from solder resist (15).
2. A method to assemble a substrate (21) according to claim 1 characterized in that
  - 20       the vent holes (22) are closed at one end by a layer of solder resist (15) on the upper surface of the substrate (21).
3. A method to assemble a substrate (3) according to claim 1 or claim 2
  - 25       characterized in that the vent holes (4) are include solder resist (15).
4. A method to assemble a substrate (3; 21) according to one
  - 30       of claims 1 to 3 characterized in that the vent holes (4, 22) are formed by drilling.

5. A method to assemble a substrate (3; 21) of one of claims 1 to 4

characterized in that

5 the vent holes (4) are formed in the core material (5) before a plurality of upper contact traces (6) and upper contact pads (7) on its upper surface, a second plurality of lower conducting traces (8) and external contact areas (9) on its bottom surface and conducting vias (10) are deposited.

6. A method to assemble a semiconductor package (1; 18; 20), comprising the following steps:

- 15 - providing the substrate (3; 21) with a method according to one of claims 1 to 5,
- providing a semiconductor chip (2) comprising an active surface including a plurality of chip contact areas (13),
- 20 - mounting the chip (2) on the upper surface of the redistribution board (3; 21) by microscopic solder balls (14) between the chip contacts (13) and upper contact areas (7),
- performing a solder reflow,
- 25 - underfilling the area between the chip (2) and the upper surface of the redistribution board (3; 21) with epoxy resin (16).

7. A method to assemble a semiconductor package (18) characterized in that

30 the upper surface of the chip (2) and substrate (3; 21) are covered with mold material (19).

8. A substrate (3; 21) for a semiconductor package (1; 18; 20) comprising:

- a sheet of core material (5),
- a plurality of upper conducting traces (6) and upper  
5 contact pads (7) on its upper surface, a second plural-  
ity of lower conductive traces (8) and external contact  
areas (9) on its bottom surface and a plurality of con-  
ducting vias (10) connecting the upper conducting  
traces (6) and lower conducting traces (8),
- 10 - a plurality of vent holes (4), and
- a layer of solder resist (15) covering the upper and  
lower surfaces of the substrate (3) leaving the contact  
areas (6 and 8) free from solder resist (15).

15 9. A substrate (3) according to claim 8  
characterized in that  
the vent holes (4) are include solder resist (15).

10. A substrate (21) according to claim 8  
20 characterized in that  
the vent holes (22) are closed at one end by a layer of  
solder resist (15) on the upper surface of the substrate  
(21).

25 11. A substrate (3; 21) according to one of claims 8 to 10  
characterized in that  
the plurality of vent holes (4; 22) are laterally located  
towards the centre of the substrate (3; 21).

30 12. A substrate (3, 21) according to one of claims 8 to 11  
characterized in that

the plurality of vent holes (4; 22) are laterally located towards the centre and towards the outer edges of the substrate (3, 21).

5 13.A substrate (3; 21) according to one of claims 8 to 12 characterized in that the vent holes (4; 22) have a diameter of approximately 1 $\mu$ m to approximately 5mm or approximately 10 $\mu$ m to approximately 0.5mm or approximately 100 $\mu$ m.

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14.A semiconductor package (1; 18; 20) comprising:

- a substrate (3; 21) according to one of claims 8 to 13,
- a semiconductor chip (2) including an active surface with a plurality of chip contact areas (13), electrically connected to the substrate (3; 21).

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15.A semiconductor package (18; 20) according to claim 14 characterized in that the chip (2) is encapsulated by mold material (19).

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16.A semiconductor package (1; 18; 20) according to claim 14 or claim 15 characterized in that the chip (2) is mounted to the substrate (3; 21) by the flip-chip technique.

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Reference Numbers

- 1 semiconductor package
- 5 2 semiconductor chip
- 3 redistribution board
- 4 non-plated through hole
- 5 core material
- 6 upper conductive trace
- 10 7 upper contact pad
- 8 lower conductive trace
- 9 external contact area
- 10 plated via hole
- 11 metal coating
- 15 12 solder ball
- 13 chip contact area
- 14 microscopic solder ball
- 15 solder resist
- 16 underfill material
- 20 17 arrow
- 18 overmolded semiconductor package
- 19 mold material
- 20 semiconductor package
- 21 redistribution board
- 25 22 closed-end vent holes